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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/757,204

01/14/2004

Chih-Ming Ke

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11/15/2006

DUANE MORRIS, LLP
IP DEPARTMENT
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PHILADELPHIA, PA 19103-4196

EXAMINER

NGUYEN, SANG H

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/757,204	Applicant(s) KE ET AL.	
	Examiner Sang Nguyen	Art Unit 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-23,25 and 26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 1-2, 5-23, and 25-26 is/are allowed.
- 6) ☒ Claim(s) _____ is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Applicant's response to amendment on 09/06/06 has been entered. It is noted that the application contains claims 1-2, 5-23, and 25-28 and claims 3-4 and 25 have been canceled by the amendment filed on 09/06/06.

Claim Objections

Claims 12 and 23 are objected to because of the following informalities: What does applicant means "n and k values"? . Applicant should corrected or amendment in claims 12 and 23. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3-6, 8-12, 14-17, 19-23, and 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Prior Art of Present Invention (Figures 1-3 and 6) in view of Pinaton et al (U.S. Patent No. 6,141,103).

Regarding claim 1; Prior Art of Present Invention discloses a method, comprising:

(a) providing a substrate (14 of figure 2) with an organic or inorganic layer formed thereon;

(b) performing a spectral ellipsometer measurement (figure 6) and a broadband spectrometer measurement (figure 6) of said substrate (14 of figure 2 or 30 of figure 6) organic or inorganic layer in an integrated optical measurement system (31 of figure 6) ;

(c) independent of said performing, determining a thickness substrate (14 of figure 2 and page 5 paragraph 2) by a fit model data to experimental data (36 of figure 6) coupled to an experimental data output (33) and a modeling of film stack information (34, 35 of figure 6) for said organic or inorganic layer; and

(d) determining said values for said optical constants n and k of said thickness substrate (14 of figure 2) by a best fit of data (37 of figure 6) coupled to an output values

device (38 of figure 6) for said organic or inorganic layer based on said thickness, with the spectral ellipsometer measurement, the broadband spectrometer measurement, and modeling information (31, 34, 35 of figure 6), wherein n represent index of refractive and k represents extraction coefficient (pages 4-5). See figures 1-3 and 6 and pages 1-5.

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U.S. Patent Oct. 31, 2000 Sheet 2 of 7 6,141,103

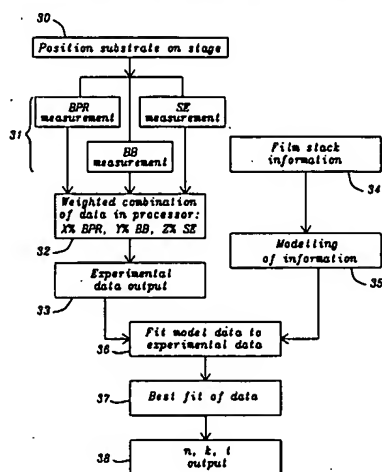
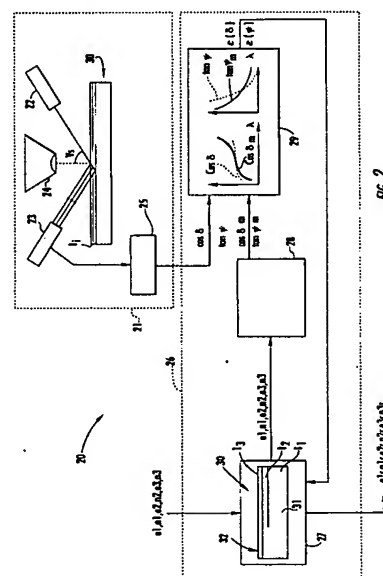


FIG. 6 - Prior Art



PAPI discloses all of features of claimed invention except for determining a thickness of an organic or inorganic layer formed a substrate. However, Pinaton et al teaches that it is known in the art to provide a computation unit (26 of figure 2) for determining a thickness of an organic or inorganic layer (l_i , 32 of 2) formed a substrate (30, 31 of figure 2 and abstract and col.5 lines 47 to col.6 lines 20). See figures 2-7.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with determining a

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thickness of an organic or inorganic layer formed a substrate as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claims 15-16, and 24; PAPI discloses the independent optical thickness measurement component (figure 6) is based on Beam Profile Reflectometry (BPR) or Beam Profile Ellipsometry (BPE).

Regarding claims 5 and 17; PAPI discloses the integrated optical measurement system is an Opti-Probe series measurement system from Thermo-Wave or a system with equivalent capability (see page 3 paragraph 2 and page 4 first paragraph).

Regarding claim 6; figure 6 of PAPI discloses the independent optical thickness measurement component (BPR of figure 6) provides experimental data (33 of figure 6) in the form of beam profiles that are matched to modeling data (36 of figure 6) in a processor to arrive at a best fit of experimental data to modeling data (37, 38 of figure 6).

Regarding claims 8, 19, and 25; PAPI discloses said thickness data is combined with measurement data from said SE and BB measurements (31 of figure 6) to provide an experimental data output (32 of figure 6) for said organic or inorganic layer.

Regarding claims 9, 20, and 26; PAPI discloses said experimental data output (32 of figure 6) is fitted to modeling data (36 of figure 6) to provide a best fit of experimental data (37 of figure 6) to modeling data.

Regarding claims 10, 21, and 27; PAPI discloses said best fit of experimental data (37 of figure 6) to modeling data provides said values for said optical constants n and k for said organic or inorganic layer (38 of figure 6).

Regarding claims 11, 22, and 28; PAPI in view of Pinaton et al discloses all of features of claimed invention except for said organic or inorganic layer is a 248 nm photoresist, a 193 nm photoresist, or an anti-reflective (ARC) layer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with said organic or inorganic layer is a 248 nm photoresist, a 193 nm photoresist, or an anti-reflective (ARC) layer, since it has been held that the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only skill in the art. In re Aller, 105 USPQ 223.

Regarding claim 12; PAPI discloses all of features of claimed invention as indicated above claim 1, except for a substrate having a stack of layers comprised of a top photoresist layer and a bottom layer formed thereon, inputting a thickness and values of the bottom layer into a program used to make calculations, and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer. However, Pinaton et al teaches that it is known in the art to provide a substrate (30 of figure 2) having a stack of layers (col.5 lines 28-30, for example, a plurality of superimposed parallel layers) comprised of a top photoresist layer (i.e., upper layer L_3 and see col. 6 lines 18-19) and a bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) formed thereon, inputting a thickness and values of the bottom layer into a program used to make calculations by computation unit (26 of figure

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2 and col. 5 line 47 to col.6 line 20), and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer(col.6 lines 21-37) . See figures 2-7. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with a substrate having a stack of layers comprised of a top photoresist layer and a bottom layer formed thereon, inputting a thickness values of the bottom layer into a program used to make calculations, and determining values thickness of the top photoresist layer based on data that includes the thickness of the top photoresist layer as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claim 14; PAPI discloses all of features of claimed invention as indicated **above claims 1 and 12**, except for determining thickness and values of the bottom layer on the substrate. However, Pinaton et al teaches that it is known in the art to provide a bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) formed the substrate (30 of figure 2) and computation unit (26 of figure 2) coupled to spectrometer (25 of figure 2) for determining thickness and values of the bottom layer (i.e., lower layer L_1 and see col.6 lines 14-15) on the substrate (30 of figure 2 and col.5 lines 47 to col.6 lines 30). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with determining thickness and values of the bottom layer on the substrate as taught by Pinaton et al for the purpose of

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measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Regarding claim 23; PAPI discloses all of features of claimed invention as indicated above claims 1 and 12, except for a substrate having a stack of layers comprised of a bottom inorganic layer, a middle organic layer, and a top photoresist layer formed on thereon, inputting a thickness and values of the bottom inorganic layer and the middle layer into a program used to make calculations. However, Pinaton et al teaches that it is known in the art to provide a substrate (30 of figure 2) having a stack of layers (col.5 lines 28-30, for example, a plurality of superimposed parallel layers) comprised of a bottom inorganic layer (i.e., lower layer L_1 and see col.6 lines 14-15), a middle organic layer (i.e., an intermediate layer L_2 and see col.6 lines 16-17), and a top photoresist layer (i.e., upper layer L_3 and see col. 6 lines 18-19) formed thereon, inputting a thickness and values of the bottom layer (L_1) and the middle layer (L_2) into a program used to make calculations by computation unit (26 of figure 2 and col. 5 line 47 to col.6 line 20). See figures 2-7. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with a substrate having a stack of layers comprised of a bottom inorganic layer, a middle organic layer, and a top photoresist layer formed on thereon, inputting a thickness and values of the bottom inorganic layer and the middle layer into a program used to make calculations as taught by Pinaton et al for the purpose of measuring high sensitivity to the two essential parameters of dose and energy over a wide range of values of the parameters and implementing using recyclable test wafers.

Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over PAPI in view of Pinaton et al as applied to claims 1 and 12 above, and further in view of Coates et al (U.S. Patent No. 4,826,321).

Regarding claims 2 and 13; PAPI in view of Pinaton et al discloses all of features of claimed invention except for said organic or inorganic layer has a thickness in the range of about 300 to 10000 Angstroms or 1000 to 10,000 Angstroms. However, Coates et al teaches that it is known in the art to provide measuring thin film thickness layer (24 of figure 1) has the range of from about 10 to 1500 Angstroms (abstract and col.1 lines 30-35). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with said organic or inorganic layer has a thickness in the range of about 300 to 10000 Angstroms or 1000 to 10,000 Angstroms as taught by Coates et al for the purpose of measuring accuracy thickness on the substrate. Further, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over PAPI in view of Pinaton et al as applied to claims 1 and 12 above, and further in view of Opsal et al (U.S. Patent No. 6,671,047).

Regarding claims 7 and 18; PAPI in view of Pinaton et al discloses all of features of claimed invention except for discloses a Critical Point model otherwise known as a harmonic oscillator approximation. However, Opsal et al teaches that it is known in the art to provide a Critical Point model otherwise known as a harmonic

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oscillator approximation (col.7 lines 40-50). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine PAPI's method with a Critical Point model otherwise known as a harmonic oscillator approximation as taught by Opsal et al for the purpose of measuring accuracy thickness on the substrate.

Response to Arguments

Applicant's arguments filed 09/06/06 have been fully considered but they are not persuasive. PAPI and Pinaton et al does not teaches or suggest determining thickness using an independent optical thickness measurement component based on Beam Profile Reflectometry or Beam Profile Ellipsometry, i.e., independent of the spectral ellipsometer measurements and broadband spectrometer measurements, as in the claimed invention.

This argument is not persuasive. In response to applicant's arguments, that PAPI and Pinaton et al does not teach or suggest "determining thickness using an independent optical thickness measurement component based on Beam Profile Reflectometry or Beam Profile Ellipsometry, i.e., independent of the spectral ellipsometer measurements and broadband spectrometer measurements" as in claim 1, 12, 23. As stated above Office action, PAPI discloses the claimed invention as indicated at chart of figure 6 that determining thickness of the substrate (30 of figure 6) using an independent optical thickness measurement component based on Beam Profile Reflectometry or Beam Profile Ellipsometry (at step of 31 as indicate BPR of figure 6), i.e., independent of the spectral ellipsometer measurements (SE measurements of figure 6 at step of 31) and broadband spectrometer measurements

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(BB measurement of step 31 in figure 6) to coupled to a fit model data (36 of figure 6), a best fit of data 937 of figure 6), and n (refractive index), k (coefficient), t (thickness) of output unit (38 of figure 6).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, references PAPI, Pinaton et al, Coates et al teaches measuring and determining thickness of the thin film on the substrate with refractive index and coefficient by either ellipsometer or spectroscopy composite optical measurement system as Beam Profile Ellipsometer, Beam profile Reflectometer, Broadband Reflective Spectrometer. i.e.

For the reasons set forth above the arguments, it is believed that the rejection of the claims 1-2, 5-23, and 26-28 under 35 U.S.C 103 (a) is proper.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al (6710889) discloses method for improved dielectric layer metrology calibration; Chen et al (6646752) discloses method and apparatus for measuring thickness of a thin film; Hirose (6151116) discloses evaluation method for thin film; Opsal et al (6583876) discloses apparatus for optical measurements of nitrogen concentration in thin film; or Johnson (5452091) discloses scatter correction in reflectivity measurements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.

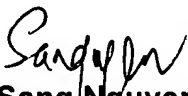
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

November 12, 2006


Sang Nguyen
Patent Examiner
Art Unit 2877